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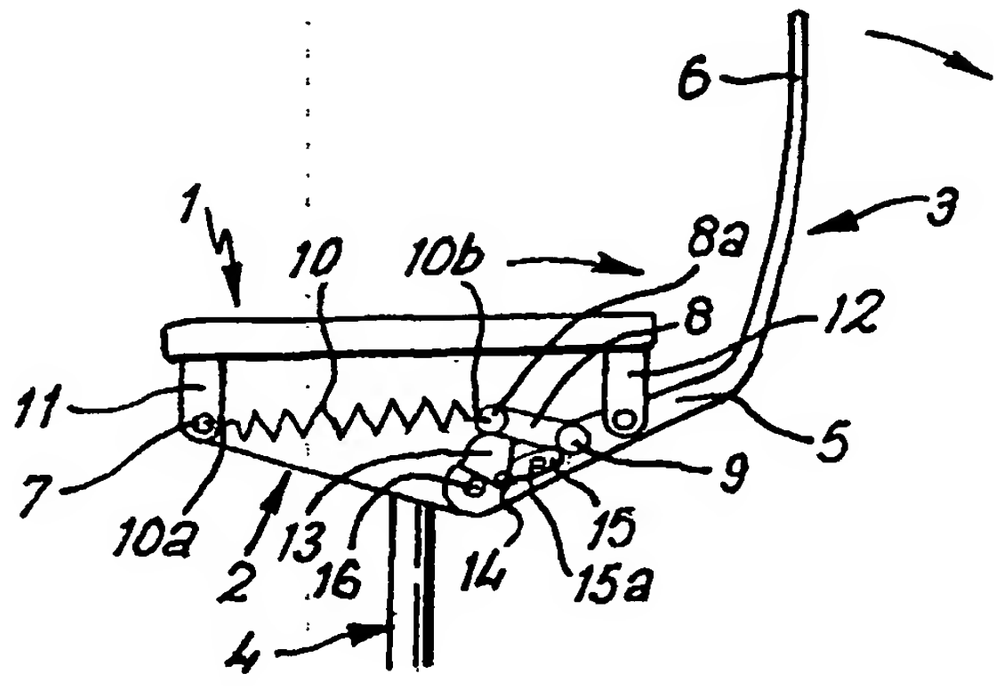
(54) Title: CHAIRS



(57) Abstract: A chair having a tiltable back part (3) and a separately tiltable seat part (1) mounted on a base part (2) has a mexhanism including a main compression spring (10) which provides adjustable resistancce to the tilting movement. The spring (10) is generally level and has rear ends (10B) which coacts with positionally adjustable members (13 or 21, 22) which defines a shaped path of movement for the spring ends (10b). In one embodiment the members (13) have shaped surfaces over which rollers (8a) run, and cams (15) are used to pivotally adjust the position of the members (13). In another embodiment th members (21) are links (21) pivotally supported on positionally adjustable receiving structures (22), and cams (23) are used to adjust the positions of the structures and hence change the pivot points of the links (21).

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CHAIRS

This invention relates to a chair, such as an office chair, of the kind having a base part, a seat part mounted on the base part, and a back part connected to the base and seat parts, whereby the back part can tilt, and the seat part can move relative to the base part, against a spring force, under the action of the weight of a person sitting on the chair.

A known chair of this kind, as described in DE 4313301C has a parallelogram-type linkage defined by generally horizontal structures of the seat and base parts and generally vertical pivotal links between such parts at forward and rearward positions, as shown in the schematic sketch of Figure 1 hereto. The spring force is provided by a generally vertical spring between the seat and base part structures and the rearward links are pivotally connected to the base part via a pivotally mounted forward end of a structure of the back part.

With this known arrangement, the seat part can tilt through an angle which is sufficient to permit adjustment of the seating position but is limited so that undue movement likely to give rise to an unsafe condition can be avoided. At the same time, the back part can tilt through an angle which is greater than the angle of movement of the seat part to facilitate attainment of a comfortable sitting position.

The generally vertical spring gives a comfortable cushioning effect but this is not readily adjustable to accommodate different weights. Also, the

vertically arranged spring is not conducive to the design of an aesthetically pleasing slim-line chair mechanism.

It is also known to use a generally horizontal compression spring with a parallelogram-type chair construction, as shown for example in US 4962962, one embodiment of which is indicated schematically in Figure 2 hereto. The spring is connected between forward and rearward links, the rearward connection being via a positionally adjustable connecting member which automatically adjusts the spring force in correspondence with the weight of the person sitting on the chair. Positional adjustment of the connecting member is attained as a consequence of its movement with variation in the weight applied whereby there is the problem of ensuring that a desired adjusted position can be readily attained and maintained.

An object of the present invention is to enable an adjustment of spring force to accommodate different weights to be attained and maintained with a relatively simple and convenient construction.

According to the invention therefore there is provided a chair having a base part, a seat part mounted on the base part, and a back part connected to the base and seat parts, whereby the back part can tilt and the seat part can move relative to the base part against a spring force, under the action of the weight of a person sitting on the chair, wherein the spring force is provided by a main spring means arranged to act in substantially level disposition and which has a positionally adjustable

mounting at one end thereof for adjustment of the spring force characterised in that the positionally adjustable mounting is provided by the said one end which coacts with an abutment member providing a shaped movement path for the said end, said abutment member being positionally adjustable for adjustment of the said path.

With this arrangement, the adjustment of spring force can be attained and maintained with simple and convenient construction.

In one embodiment the abutment member has a shaped surface which defines said shaped path. In this case, the abutment member is preferably positionally adjustable by pivoting thereof, whereby the spring means moves along different paths, corresponding to different portions and/or dispositions of the shaped surface with which the said one end coacts at different angular adjustment positions of the abutment member. The shaped abutment surface may be generally curved or arcuate or of any other suitable simply or complex shape.

Most preferably the arrangement is such that the said one end of the spring means coacts from above with the shaped surface of the abutment member. A roller or other contact structure may be provided at the said one end of the main spring means for coaction with the abutment surface and they may be urged into constant contact by the action of the main spring means or otherwise.

In an alternative embodiment, the abutment member comprises a link

pivotally mounted on an intermediate member, the pivotal movement of the link defining said shaped path and the intermediate member being movable for said positional adjustment of the abutment member.

The link may be pivotally mounted on the intermediate member by location of an end thereof in a receiving portion of the intermediate member.

Preferably the arrangement is such that a retention device is provided to hold the abutment member in an adjusted position.

A shaped cam member may be provided which is rotatable in engagement with the abutment member to effect said positional adjustment thereof. The cam member may have a cam surface which coacts with the abutment member, and the cam may be mounted on a spindle or other means to facilitate rotation of the cam. A latch may be provided, e.g. operating on the spindle, to act as the aforesaid retention device.

In one arrangement there is provided a manual control for effecting said positional adjustment of the abutment member. This may act on the above mentioned cam spindle.

In an alternative arrangement, the abutment member may be linked to the seat part so as to be automatically positionally adjustable under the action of the weight of a person sitting on the chair. A ratchet or the like may be provided, as the aforesaid retention device, to retain the abutment member in an adjusted position. A spring means may be provided to return

the movable member from an adjusted position to a pre-adjusted position when the weight of the person is removed from the chair. This may constitute the aforementioned main spring means and/or a supplementary spring means.

Most preferably the said one end of the main spring means is a rearward end thereof.

The main spring means and/or supplementary spring means may comprise a compression helical coil spring. Alternatively any other suitable kind of spring means, such as a hydraulic or pneumatic ram or other kind of spring, may be used.

Most preferably the seat part and the base part may have structures connected by forward and rearward pivotal links particularly to define a parallelogram linkage construction.

The back part may be pivotally mounted on the base part and the rearward links may be connected to the base part via the back part.

The main spring means may be connected to the base part via a connection member which may comprise a pivotal arm.

The chair may be an office chair in which case the base part may comprise the top part of the usual floor engaging column-type support; the seat part may support the usual seat cushion; and the back part may comprise a rigid generally L-shaped structure having a forward end extending in level disposition for connection to the base part and a rearward

upright end for supporting the usual back cushion.

The invention also provides a mechanism, for the chair described above, comprising a main spring means arranged to act in substantially level disposition and which has a positionally adjustable mounting at one end thereof for adjustment of the spring force characterised in that the positionally adjustable mounting is provided by the said one end which coacts with an abutment providing a shaped movement path for the said end, said abutment member being positionally adjustable for adjustment of the said path.

With the above first embodiment of the invention as described above the variation in spring resistance is determined by the profile of the shaped surface of the abutment member. The mode or pattern of variation can be changed by changing the profile of the movable member e.g. by use of substitute movable members.

With the second embodiment of the invention the variation in spring resistance is determined by the arc of movement of the link which can be changed by moving the intermediate member. Conveniently this may be done with a faceted cam, particularly a cam having a progressively increasing radial dimension in the manner of a so-called snail cam.

The faceted snail cam can help prevent unwanted positional change, and consequent unwanted change in positioning, when the force applied to the chair mechanism varies due to a person sitting on the chair shifting his

or her weight.

The invention will now be described further by way of example only and with reference to the accompanying drawings in which:-

Figures 1 & 2 are schematic representations of two prior art chair constructions;

Figure 3 is a schematic representation of one form of a chair according to one aspect of the present invention;

Figure 4 is a schematic representation of an alternative form of chair;

Figure 5 is a more detailed top perspective view of the mechanism of the chair of Figure 3;

Figures 6-9 are detailed side views of the mechanism of the chair of Figure 3 in different positions of use and different levels of adjustment; and

Figures 10 & 11 are detailed side views of an alternative mechanism in two levels of adjustment.

Referring to Figure 3 this shows an office chair having a seat part 1, a base part 2 and a back part 3.

The base part 2 comprises a plate structure mounted at the top of a vertical central support pillar 4 attached at its lower end to the usual five-arm wheeled floor-engaging structure.

The seat part 1 comprises a frame structure which supports a padded

seat cushion.

The back part 3 comprises a rigid L-shaped member having a lower forwardly projecting limb 5 and a rearward upright limb 6 which supports a back cushion.

The base part 2 has a forward extension with a pivot axle 7 fixed transversely at its front end.

At the rear end portion of this extension the front end of an upwardly inclined box structure is pivotally mounted, about a transverse axis 16 parallel to the forward pivot axle 7. The rearward end of this box-structure forms the forward limb 5 of the L-shaped member of the back part 3.

Two spaced apart side-by-side link arms 8 have rearward ends which are pivotally mounted at the rear end portion of the box-structure about a transverse axis 9 parallel to the forward pivot axle 7.

Two large compression helical coil springs 10 are fixed at front ends 10a between the forward pivot axle 7 and at rear ends 10b between the forward ends of the two link arms 8.

The frame structure of the seat part has rigidly fixed depending links 11, 12, two spaced apart at the forward end, and two spaced apart at the rearward end of the frame structure.

The lower ends of the forward links 11 are pivotally connected to the forward pivot axle 7. The lower ends of the rearward links 12 are pivotally connected to the rearward pivotally mounted ends of the link arms 8.

The forward ends of the link arms 8 and the rear ends 10b of the springs 10 have mounted thereon rollers 8a and these engage respective shaped movable members 13 mounted on the base part 2.

The movable members 13 are generally segmental shaped solid bodies pivotally mounted about a transverse common axis 14 in the lower regions and having upper upwardly facing shaped abutment surfaces generally of curved form. The rollers 8a ride on these surfaces and are held in contact by the springs 10.

Two cams 15 are mounted on a spindle 15a rotatable about a transverse axis behind the axis 14 of rotation of the movable members 13. The cams have shaped 'snail' surfaces which press against rear sides of the movable members 13. The movable members are asymmetric as shown so that the pressure of the rollers 8a urges the members 13 against the cams 15.

A latch plate is movable into engagement with the spindle 15a to lock this against rotation at least in one direction.

The spindle 15a projects outwardly at one side through an arcuate slot in the side of the box structure 5.

In use, with the arrangement described above a person sitting on the seat cushion causes this to move backwards with the rear end tilting down and the forward end tilting up, as a consequence of the linkage between the seat, base and back parts, under the action of the person's weight. At the

same time, the back part 3 is pivoted backwards about its pivotal mounting (axis 16) on the base part 2. The rollers 8a ride over the shaped surfaces of the members 13 as the springs 10 are extended.

This movement is resisted by the compression springs 10 which are arranged to bias the parts into the rest position at which the back part is essentially vertical and the seat part is horizontal or inclined forwardly.

The spring force of the springs 10 depends on the length and line of action of the spring i.e. between the forward pivotal axle 7 and the rearward pivotal mounting (axis 9) of the links 8, and this varies during movement in a manner determined by the shape and disposition of the portions of the surfaces of the members 13 over which the rollers 8a run. The proportion and dispositions of the members can be adjusted by positional adjustment of the members with the cams 15. The shapes of the members 13 can be changed by substituting different members 13.

Rotation of the cams 15 causes the members 13 to rotate and re-position. The cams, and hence the members 13, retain their adjusted positions.

Figures 6 & 8 show forward positions at low and high tension settings, and Figures 7 & 9 show corresponding rearward positions.

This arrangement provides a simple yet effective means of adjusting and maintaining a desired spring force to suit the weight of the person sitting on the chair, with a desired profile change in resistance during

movement (which is not necessarily linear-depending on the shapes of the members 13).

The end of the cam spindle 15a projects at a convenient position where the spindle or an end knob or lever can be readily reached and adjusted by hand.

The main part of the mechanism, namely the base plate 2, springs 10, link arms 8, box structure 5 and associated components can be made as a separate, installable mechanism which can have a pleasing and convenient 'slim-line' profile.

Referring now to Figure 4 this shows an alternative embodiment which utilises automatic adjustment of spring force.

The same reference numerals are used to indicate parts corresponding to the parts in the embodiment of Figure 3.

The rollers at the rearward ends of the springs engage the top surface of the movable member 13, as with the arrangement of Figure 3. However, the cams 15 and spindle 15a are omitted and instead the movable member 13 is connected to an arm 17 on which the rearward links 12 are pivotally mounted and which is linked to the back part 3 by a link 19. A compression spring (not shown) is provided beneath the arm 17 between this and the base part 2.

A curved toothed rack 18 engageable with a pawl is provided between the arm 17 and the base part 2.

With this arrangement, when a person first sits on the chair with the chair back in a forwards position, as shown in Figure 8, the rollers 8a are directly above the pivot axis 14 of the members 13 whereby there is no turning movement applied to the members 13 and the force applied to the attached links 17 is zero. The pawl and rack 18 are therefore free to move relative to each other and the weight applied by the person sitting on the chair, can therefore move the pawl relative to the rack 18, against the compression force of the spring beneath the arm 17 and cause the arm 17 to adjust the position of the movable member 13.

When the person leans backwards the back part 3 and seat part 2 can now pivot rearwardly in the manner described with reference to Figure 3. This moves the roller 8a out of vertical alignment with the axis 14 as shown in Figure 9 whereby a force is now applied via the arm 17 to the pawl and rack 18 to cause interengagement of these and consequent locking of the member 13 in the adjusted position.

When the person rises from the chair, the back part 3 returns to its rest position and the seat part 1 returns to its rest position, and the pawl is released from the rack to allow the movable member 13 to return to its rest position.

Figures 10 and 11 show an alternative embodiment wherein the spring mounting is supported on links 21 which in turn rests on intermediate seatings 22 which bear on axially rotatable faceted snail cams 23. The

rearward ends 10b of the springs 10 and the forward ends of the links 8 have a spindle which engages recesses in the tops of the links 21, in place of the rollers 8a of the embodiments of Figures 3-9.

The links 21 move through arcs pivoting about their contact points in the intermediate members 22. The pivot points are adjusted with the faceted cams 23. Figures 10 & 11 show respectively low and high tension settings.

The arc profiles can be changed by changing the links 21.

The embodiment of Figures 10 & 11 provides a simpler mechanism than that of Figures 3-9. Rather than moving over a shaped surface of the members 13, which can be profiled to provide any desired linear, non-linear, or varying change in tension characteristics, the links 21 provide a simpler arcuate path.

It will be noted that the intermediate members 22 of Figures 10, 11 are adapted to accommodate the members 13 of the embodiments of Figures 3-9. Thus, the mechanism can be readily made to take either the links 21 or the members 13 as desired. As described, rollers 8a are used to engage the members 13, and a spindle or axle to engage the links 21. In fact the same rollers 8a or spindle may be used for both.

It is of course to be understood that the invention is not intended to be restricted to the details of the above embodiments which are described by way of example only.

CLAIMS

1. A chair having a base part, a seat part mounted on the base part, and a back part connected to the base and seat parts, whereby the back part can tilt and the seat part can move relative to the base part against a spring force, under the action of the weight of a person sitting on the chair, wherein the spring force is provided by a main spring means arranged to act in substantially level disposition and which has a positionally adjustable mounting at one end thereof for adjustment of the spring force characterised in that the positionally adjustable mounting is provided by the said one end which coacts with an abutment member providing a shaped movement path for the said end, said abutment member being positionally adjustable for adjustment of the said path.

2. A chair according to claim 1 characterised in that the abutment member has a shaped surface which defines said shaped path.

3. A chair according to claim 2 characterised in that the shaped surface is generally curved.

4. A chair according to claim 2 or 3 characterised in that the abutment member is positionally adjustable by pivoting thereof.

5. A chair according to any one of claims 2 to 4 characterised in that the said one end coacts from above with the shaped surface of the abutment member.

6. A chair according to any one of claims 1 to 5 characterised in that the said one end coacts with the shaped surface of the abutment member through a roller mounted on the said one end.

7. A chair according to claim 1 characterised in that the abutment member comprises a link pivotally mounted on an intermediate member, the pivotal movement of the link defining said shaped path and the intermediate member being movable for said positional adjustment of the abutment member.

8. A chair according to claim 7 characterised in that the link is pivotally mounted on the intermediate member by location of an end thereof in a receiving portion of the intermediate member.

9. A chair according to any one of claims 1 to 8 characterised by the provision of a shaped cam member which is rotatable in engagement with the abutment member to effect said positional adjustment thereof.

10. A chair according to any one of claims 1 to 9 characterised by the provision of a manual control for effecting said positional adjustment of the abutment member.

11. A chair according to any one of claims 1 to 10 characterised by the provision of an automatic control linking the abutment member to the seat part whereby said positional adjustment of the abutment member is effected under the action of the weight of a person sitting on the

chair.

12. A chair according to any one of claims 1 to 11 characterised in that the main spring means comprises a compression helical coil spring.

13. A chair according to any one of claims 1 to 12 characterised in that the seat part and the base part have structures connected by forward and rearward pivotal links to define a parallelogram linkage construction.

14. A chair according to claim 13 characterised in that the back part is pivotally mounted on the base part and the rearward links are connected to the base part via the back part.

15. A mechanism for a chair according to any one of claims 1 to 14 comprising a main spring means arranged to act in substantially level disposition and which has a positionally adjustable mounting at one end thereof for adjustment of the spring force characterised in that the positionally adjustable mounting is provided by the said one end which coacts with an abutment providing a shaped movement path for the said end, said abutment member being positionally adjustable for adjustment of the said path.

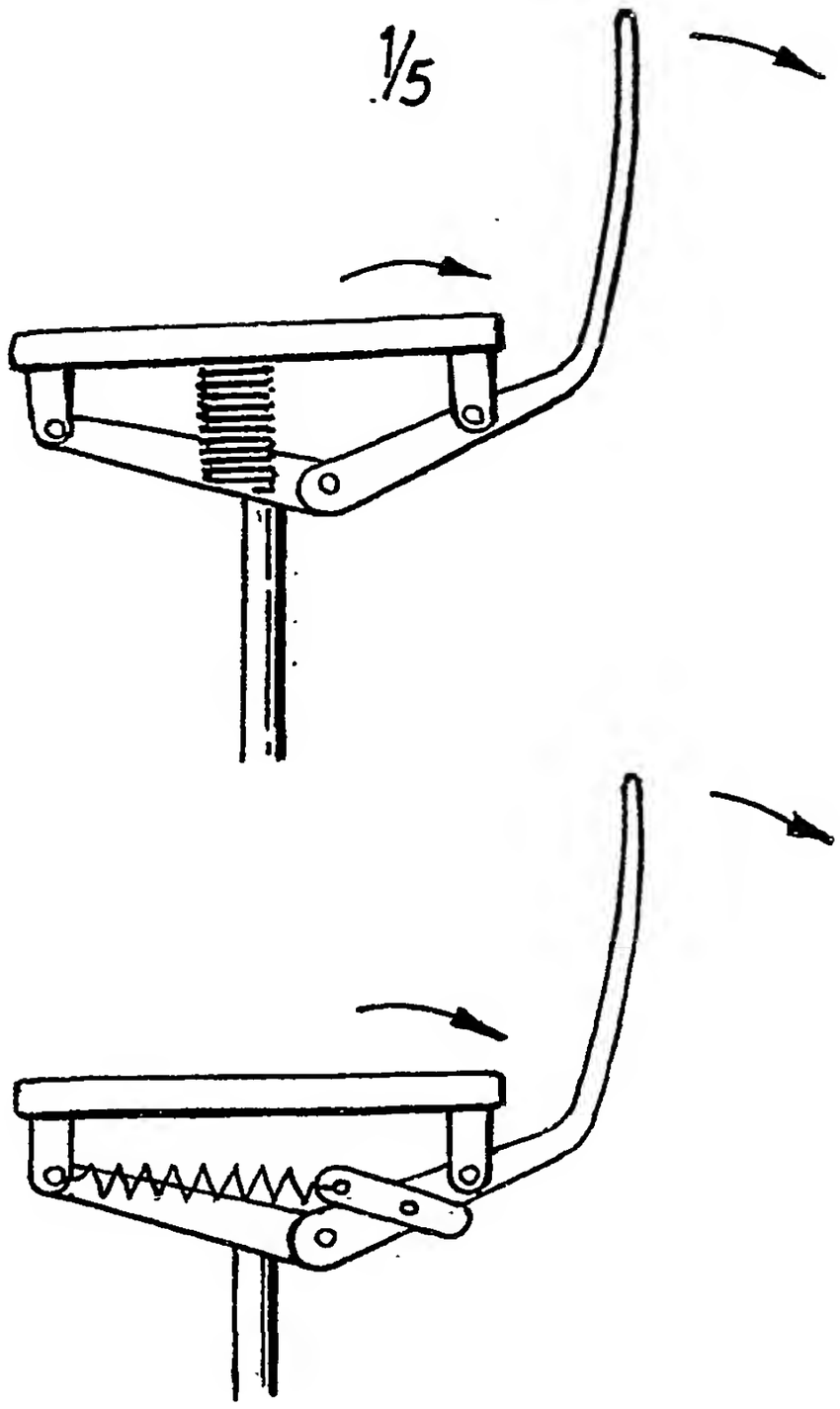

Fig. 1
Prior Art

Fig. 2
Prior Art

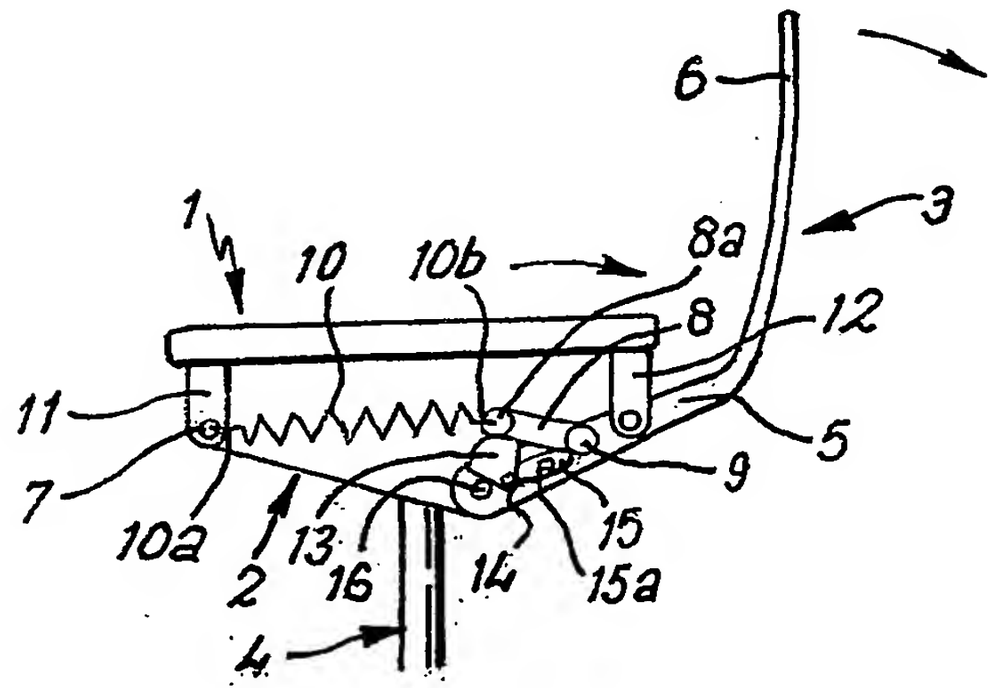

Fig. 3

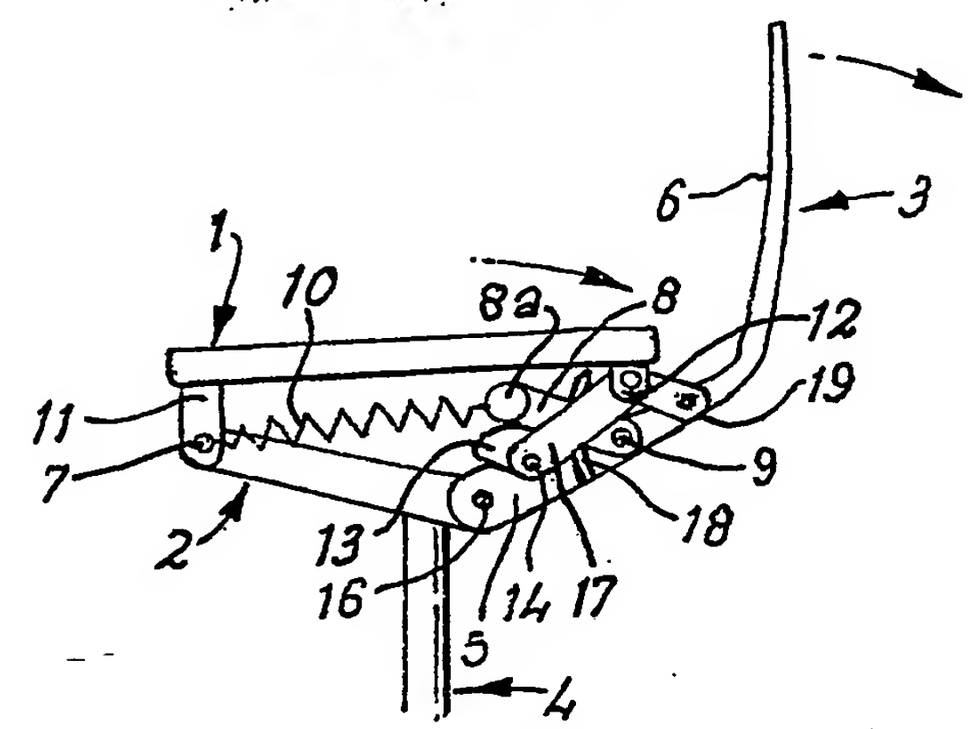

Fig. 4

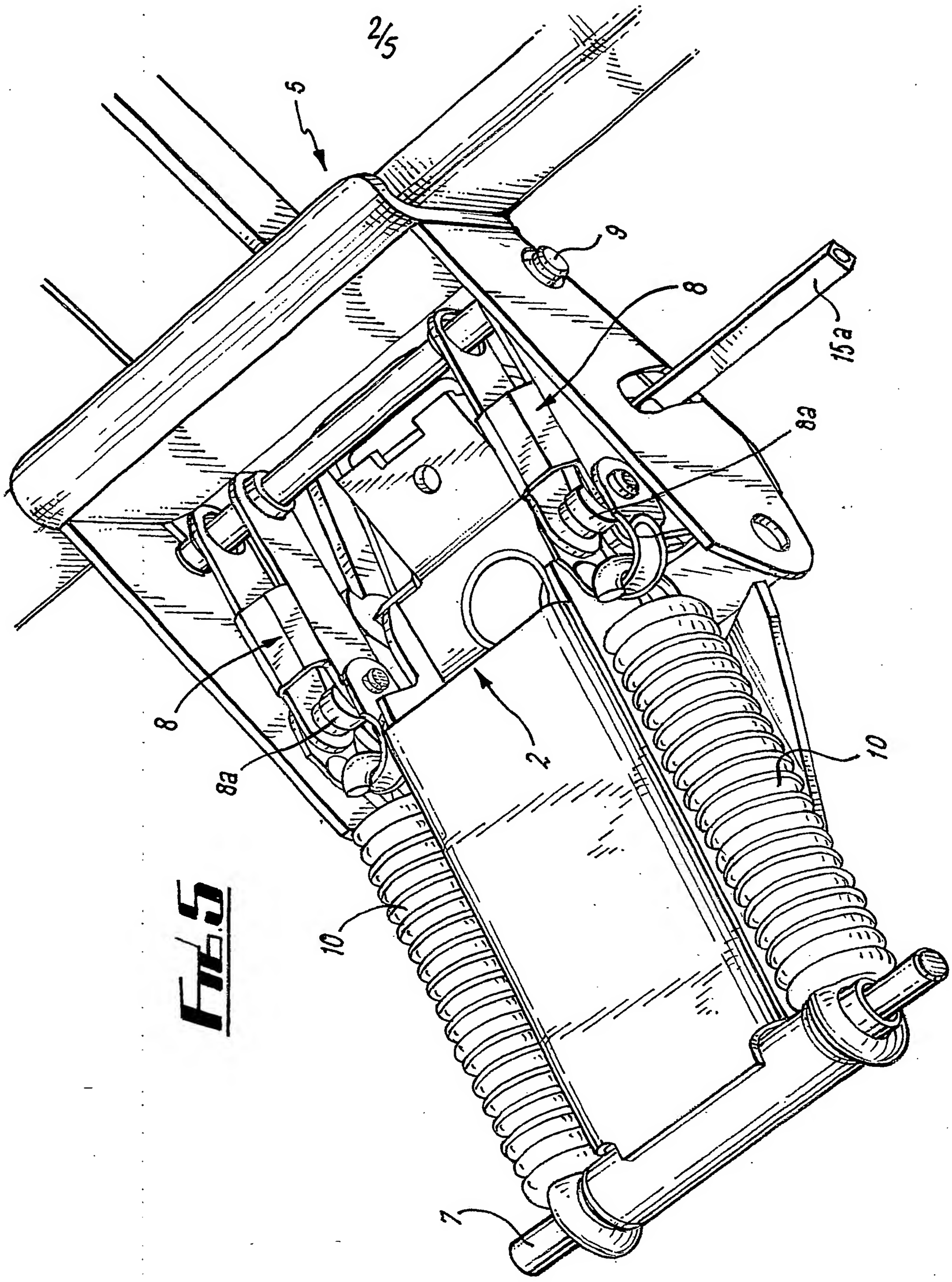

FIG.5

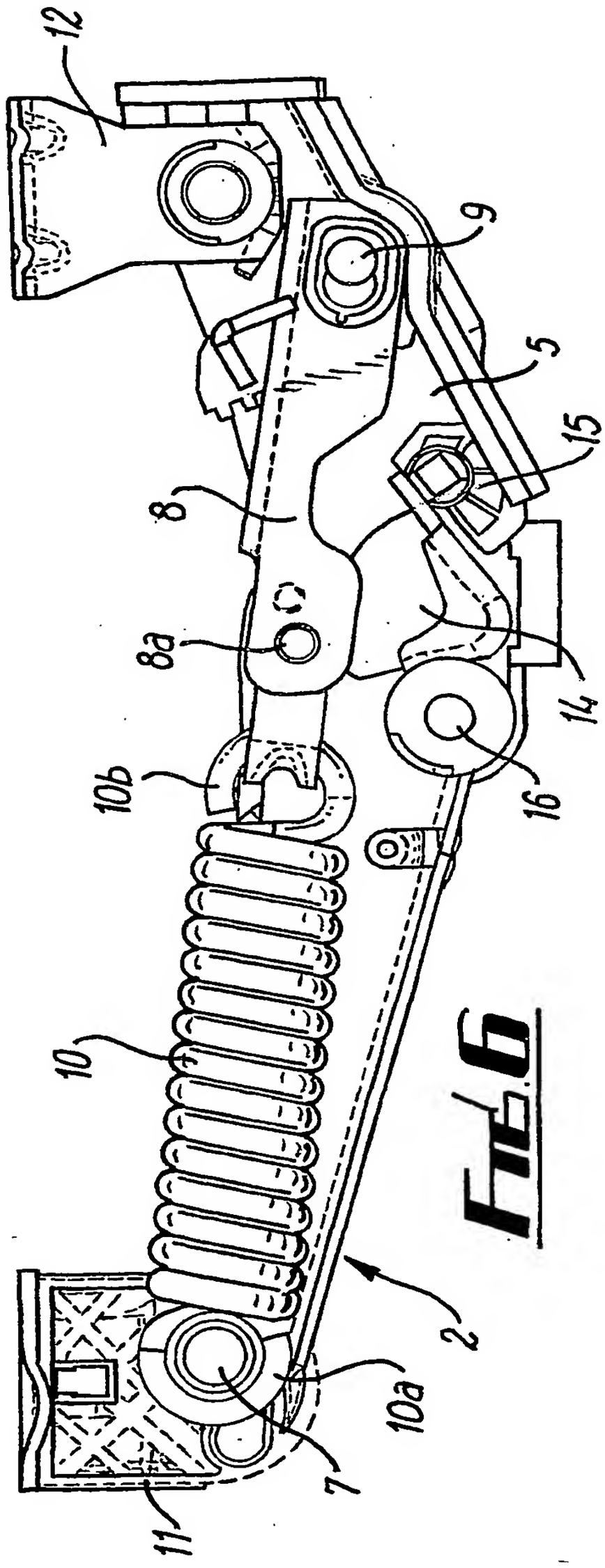

Fig. 6

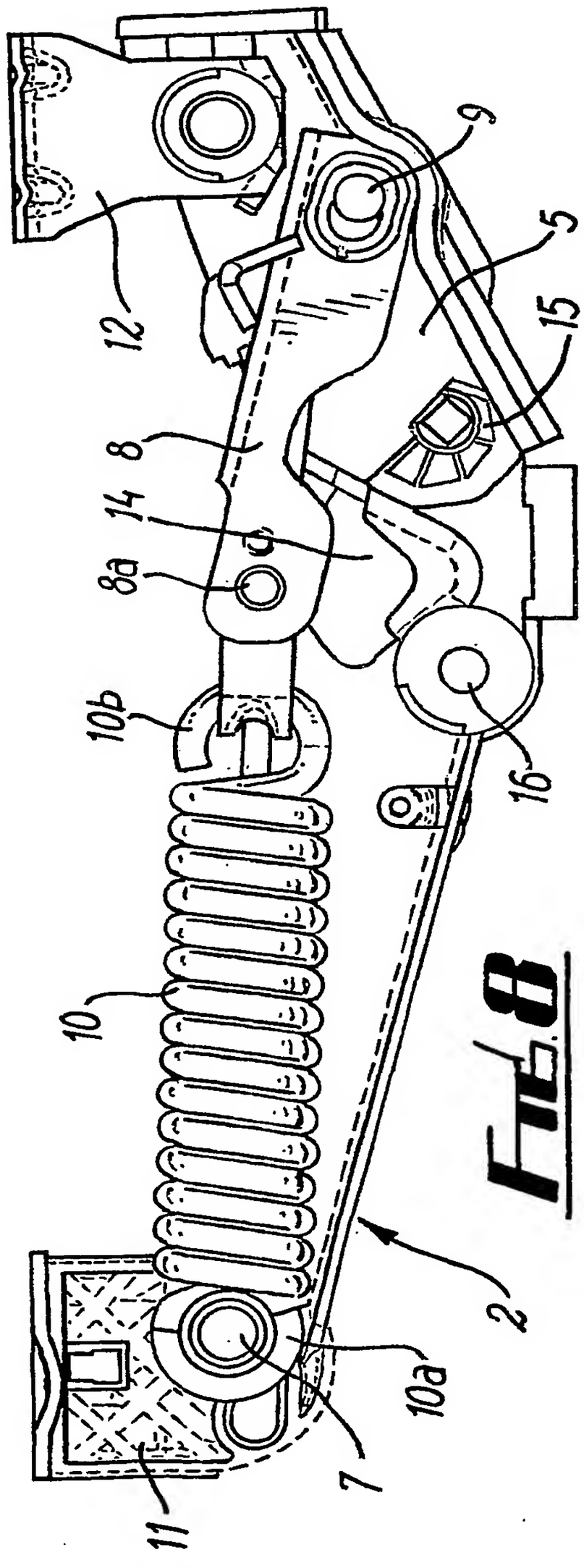

Fig. 8

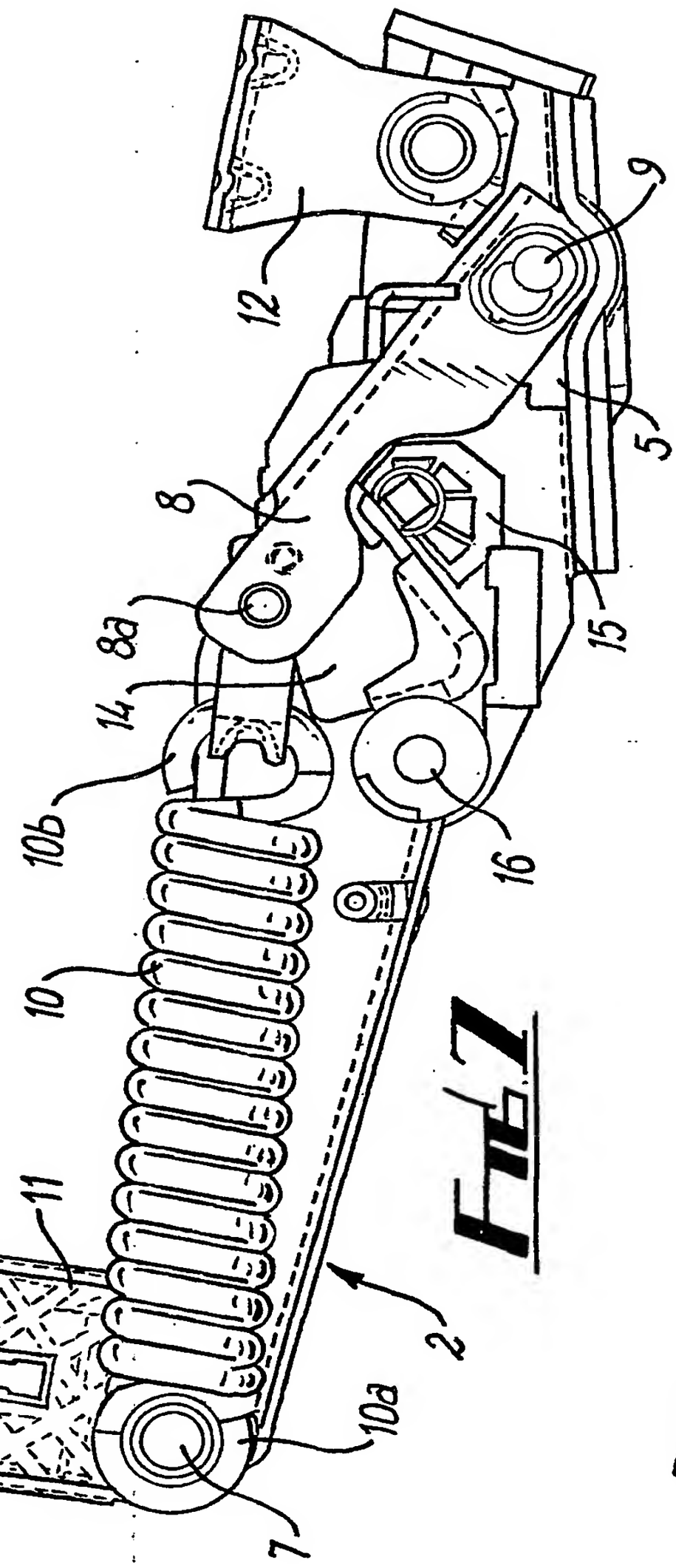

FIG 7

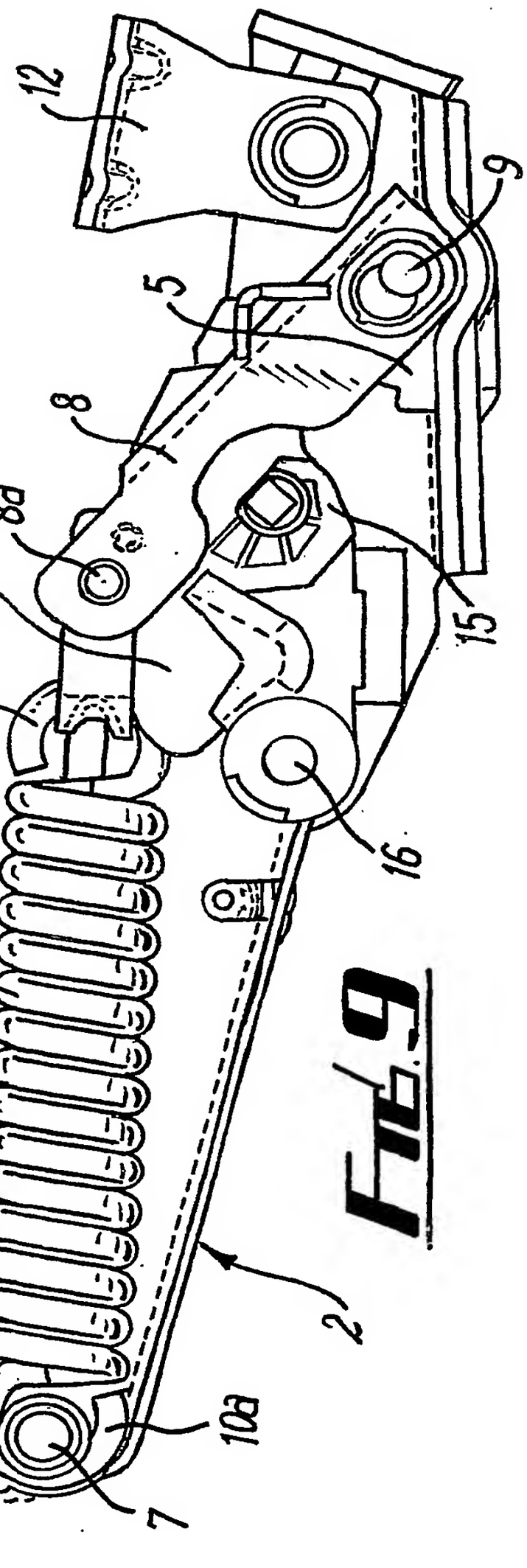

FIG 9

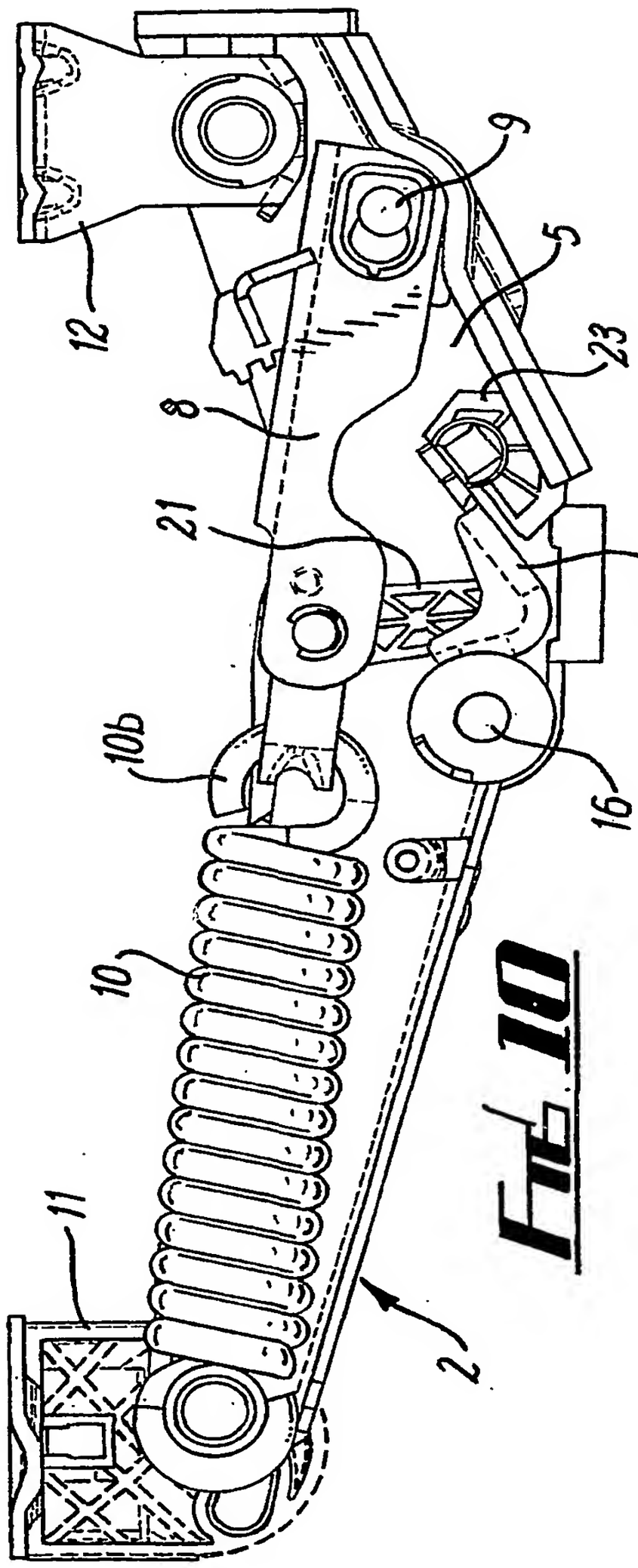

FIG. 10

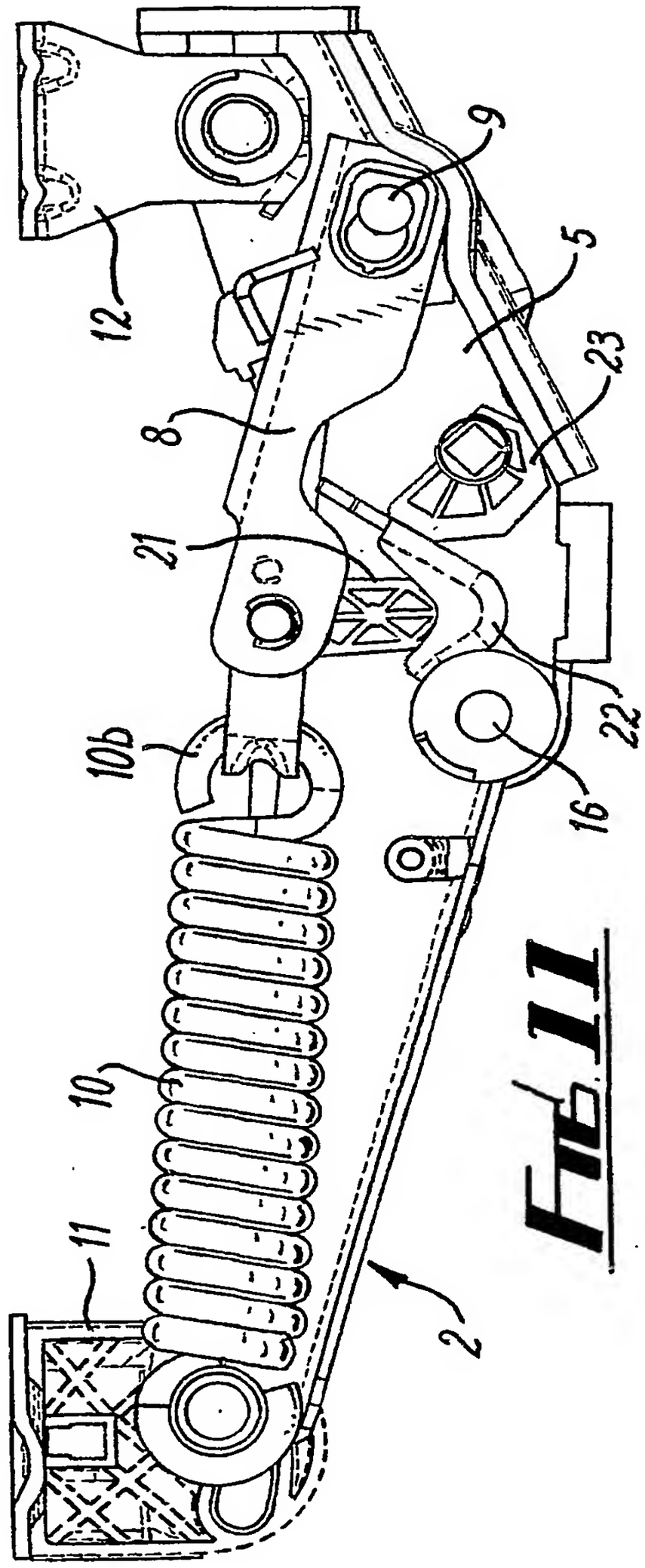

FIG. 11

INTERNATIONAL SEARCH REPORT

Int ional Application No
PCT/GB 02/00041

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A47C1/032

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A47C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 960 586 A (ROEDER PETER) 1 December 1999 (1999-12-01) claims 1,6; figures	1-15
A	DE 35 37 203 A (KLOEBER GMBH & CO) 24 April 1986 (1986-04-24) abstract; figures	1
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A	US 4 962 962 A (MACHATE RAINER ET AL) 16 October 1990 (1990-10-16) cited in the application abstract; figures	1

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

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Date of the actual completion of the international search	Date of mailing of the international search report
18 April 2002	06/05/2002

Name and mailing address of the ISA	Authorized officer
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INTERNATIONAL SEARCH REPORT

Information on patent family members

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